



Energy Storage Market Survey and Recommendations

Prepared in Compliance with D.18-01-003

Ordering Paragraph 5



Commissioner Briefing
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Commission decision requested this staff report

- D.18-01-003, OP 5, directed the Commission staff to
“Prepare and present a report on the state of utility energy storage procurement, a survey of the market, a recommendation on whether additional refinements to the energy storage procurement framework or policies are required, and procedural options for accomplishing any needed refinements or recommendations by the working group.”
- In response, this Energy Storage Market Survey:
 - **Provides** a utility storage procurement update, and
 - **Recommends** energy storage policy considerations that could be addressed in a future OIR or other storage related rulemakings.





Main Findings

- Legislative directives, regulatory program design and market dynamics have led to procurement of 1,620 MWs of new California storage capacity from 2010 to 2018, of which 420 MWs are on line.
- Utility storage procurement to meet reliability needs has outpaced the storage mandate procurement.
- Storage MUAs are occurring under the existing rule framework, but additional refinements are needed to achieve the full economic potential of storage to provide multiple services and grid value.
- Programmatic refinement of the utility storage mandate and storage grid integration measures could support California in accelerating GHG reduction, renewable integration and grid optimization goals.
- The Commission has a pending RFP to contract for a comprehensive storage market evaluation report focused on assessing achievement of key storage policy goals.





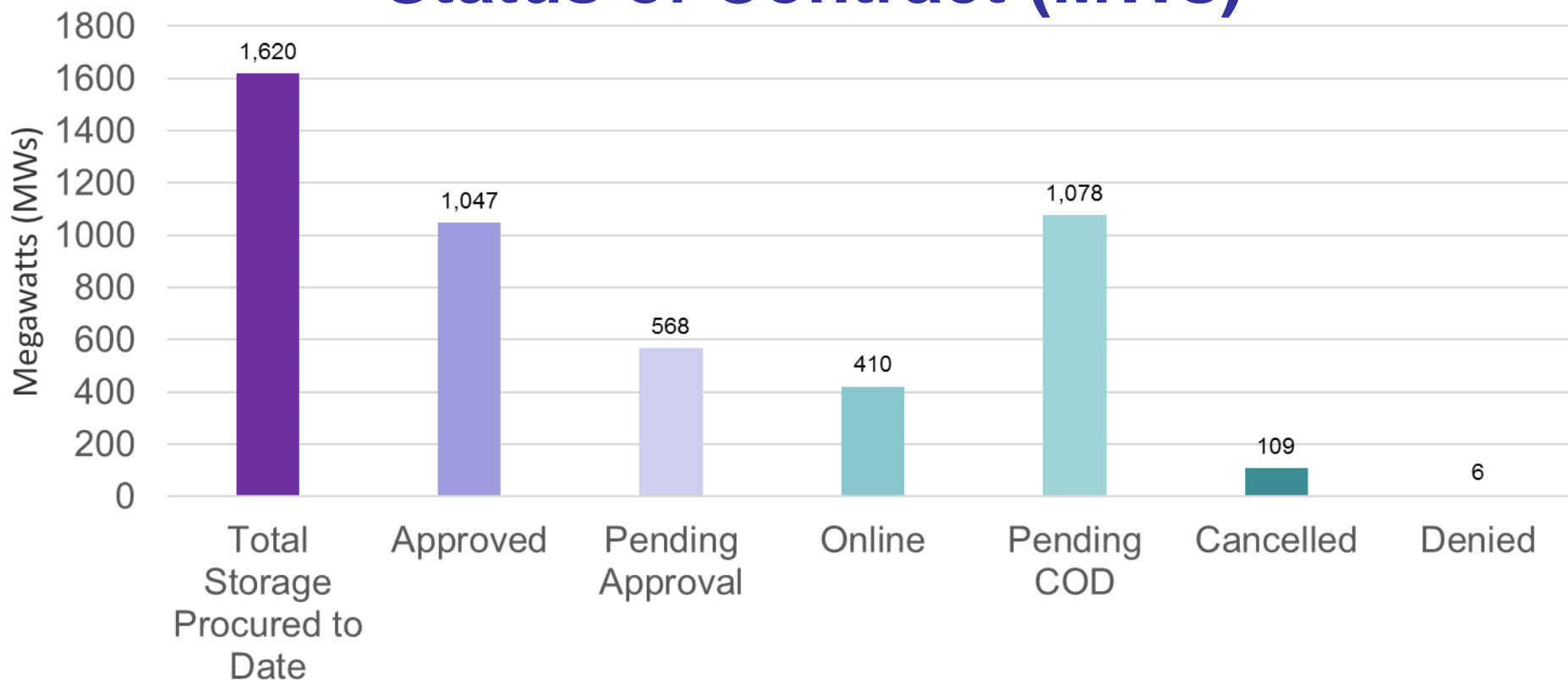
Utility Storage Procurement Results





**Procurement to date exceeds
original total mandate requirement**

IOU Procurement to date by Status of Contract (MWs)



- Most storage procurement is approved or pending approval.
- Approximately 25% of project MWs are online
- Less than 7% project cancellation rate





PG&E and SCE have remaining procurement to meet mandate

IOU Progress to date towards AB 2514 Goals (MWs)

	Grid Domains	Storage Procurement Mandate Target	Mandate Driven Storage Procurements	Other Storage Procurements	Total Storage Procurement To Date	Total Procurement Adjusted per Mandate Rules	Current Excess/ Deficiency Relative to Storage Mandate
PG&E	Transmission	310	135	557	692	544	234
	Distribution	185	36	0	36	185	0
	Customer-Side	85	36	10	46	46	-39
SCE	Transmission	310	0	120	120	171	-139
	Distribution	185	27	112	134	185	0
	Customer-Side	85	100	205	306	221	136
SDG&E	Transmission	80	-	110	110	80	0
	Distribution	55	-	57	57	56	1
	Customer-Side	30	-	29	30	30	0
	IOU Total	1,325	334	1,200	1,531	1,518	



Utility Storage Procurement Outside Biennial Storage Mandate

San Onofre Nuclear Gen Station (SONGS) Once Through Cooling (OTC)

SCE: 261 MWs in LCR RFO

25.6 MWs thermal – customer

135 MWs battery – customer

100.5 MWs battery – transmission

SDGE: 83.5 MWs in LCR RFO

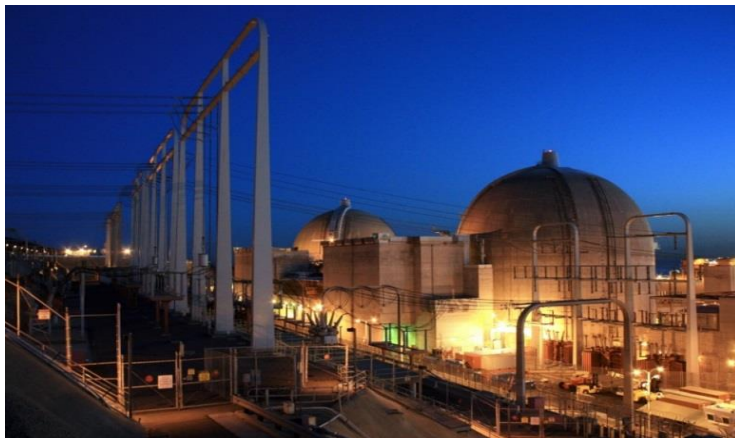
13.5 MWs battery – distribution

70 MWs battery – transmission

SCE: 125 MWs in PRP2

60 MWs battery – distribution

65 MWs battery - customer



SCE Moorpark/Goleta RFO underway.

Aliso Canyon (expedited)

SCE: 62 MWs BESS- distribution

**SDG&E: 37.5 MWs BESS –
distribution**



SB 801 (Stern, 2017)

Required CPUC to direct SCE to procure at least 20 MWs of energy storage. Resolution E-4937 fulfilled that requirement. RFO is underway.

Reliability Must Run

CPUC Resolution E-4909, 01.11.18, CPUC directs PG&E to hold RFO for storage and preferred resources to reduce need for three conventional power plant reliability must run (RMR) contracts.

PG&E 567.5 MW RFO for energy storage projects in South Bay Moss Landing Local Capacity Area. CPUC Draft Resolution E-4949 recommends approval.





Community Choice Aggregator (CCA) and Direct Access/Electric Service Provider (ESP) Storage Mandate Requirement

Storage Mandate Established CCA Requirement:

- Procure storage equivalent to 1% of CCA/DA load by 2020.
- Projects must be online by EOY 2024, similar to IOUs.
- CCA/DA receive partial (50%) credit for distributed storage funded by the Self Generation Incentive Program (SGIP).

Modifiers to Storage Mandate Procurement Requirement:

- Per D.17-04-039, CCA/DA providers may reduce their 1% obligation if their share of costs for IOU storage procurement exceeds that of the host IOU, as a total percentage of load.

CCA Storage Procurement Under Development:

- ***East Bay Community Energy and PG&E:*** Oakland Clean Energy Initiative – storage and transmission deferral project
- ***Monterey Bay Community Power and Silicon Valley Clean Energy:*** storage and solar project
- ***Marin Clean Energy:*** stand alone storage project

CCA Contracted Storage Procurement to Date: 0 MWs





Recommended Policy Refinements to Utility Storage Procurement Framework

1. Implement MUA Recommendations in a New Storage Rulemaking
2. Prioritize Storage Market Evaluation Report
3. Refine Storage Procurement Requirements
4. Consider how BTM Storage can provide Grid Services
5. Refine Storage Interconnection & Consider New Tariff Design





THANK YOU





Facilitating Multiple Use Applications (MUA) is Important

MUA is the provision of more than one service from a single storage resource, increasing the value that storage can provide to the grid.

Domain	Services
Customer	TOU bill management
	Demand charge management
	Increased consumption of on-site generation
	Back-up power
	DR Program Participation
Distribution	Distribution capacity/deferral
	Reliability (back-tie) services
	Voltage support
	Resiliency/microgrid/islanding
Transmission	Transmission deferral
	Black start
	Voltage Support
	Inertia
	Primary frequency response
Wholesale Market	Frequency regulation
	Imbalance energy
	Spinning Reserves
	Non-spinning reserves
	Flexible Ramping Product
Resource Adequacy	System RA capacity
	Local RA capacity
	Flexible RA capacity

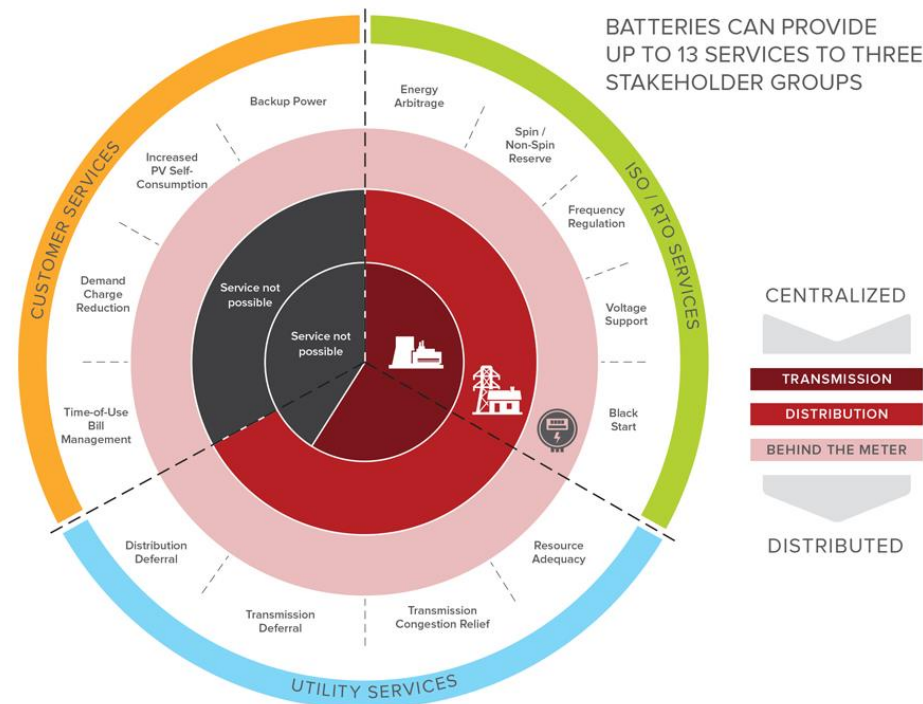


Image: Rocky Mountain Institute





CPUC Recognized the Potential of MUA in D.18-01-003

D. 18-01-003 adopted 11 rules to guide multiple use applications, focused primarily on ensuring system reliability, and 3 different MUA “types”:

- ***Time differentiated*** – resource obligation to provide reliability services during different, non overlapping time periods.
 - ***Capacity differentiated*** – resource provides reliability services using separate designated capacity of the same resource.
 - ***Simultaneous*** – resource obligation to provide overlapping or simultaneous reliability services. Most challenging MUA type.
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- ✓ D.18-01-003 directed the CPUC to create a working group to consider additional policy recommendations related to MUA.
 - ✓ The MUA Working Group included CPUC and CAISO staff, utilities and storage industry stakeholders.
 - ✓ The Working Group met 13 times over a 5 month period and completed a recommendations report on August 9, 2018.





MUA Recommendations could be scoped into a various efforts

- Define utility cost recovery rules for multiple use applications. – *currently scoped into AB 2868 proceeding.*
- Determine the appropriate rate schedule to govern charging energy for distribution level services. – *potentially in new OIR*
- Determine rules for incrementality of compensation in a public forum. – *currently scoped into IDER and DRP proceedings for all DER*
- Establish consistent measurement rules for MUAs including, but not limited to, standardized practices that direct a deviation to one MUA service versus another, or that allocate the deviation among the services. – *potential to be scoped in new OIR*
- Address reasons DERP does not qualify for resource adequacy. – *raise in next Resource Adequacy proceeding*
- Address CAISO DR measurement and settlement of resources used for capacity payments – *Raise either in next Resource Adequacy proceeding or potentially in a new storage OIR.*
- Examine MUA rules in light of increasing load migration to CCAs. - *potentially in new OIR*
- Analyze and develop parameters to allow resources to provide reliability services without overly relying on such resources for one reliability service given their incremental uncertainty due to the provision of a second reliability service. - *potentially in a new OIR*





Prioritize Evaluation Report and Procurement Refinements

- Start and Complete Evaluation:
 - Prioritize Staff Effort to Direct Storage Market Evaluation Report and consider market status and potential barriers.
- In advance of Storage Market Evaluation Report, consider storage procurement refinements that are consistent with three programmatic principles of **GHG reduction, renewable integration, and grid optimization** identified in D.13-10-040.
 - **TRACKING:** Consider requiring new storage projects to track and report GHG emissions and renewable integration associated with storage operation to the CPUC and stakeholders at the contract approval stage. Align BTM and FTM storage GHG tracking and reporting process.
 - **UNIFORM COST VALUATION ACROSS PROCUREMENT ENTITIES:** Consider directing Load Serving Entities (LSEs) to adopt a uniform Least Cost, Best Fit (LCBF) storage valuation and Net Present Value (NPV) cost methodology to ensure consistent revenue requirement and cost recovery approach when evaluating storage grid optimization.
 - **COMMON CAPACITY VALUATION METHODOLOGY:** Adopt consistent storage capacity valuation methodology across all CPUC capacity planning and procurement proceedings including IRP, GRC, RPS and RA.
 - **UPDATED STORAGE ELCC VALUES:** Adjust the CPUC electric load carrying capacity (ELCC) to reflect performance potential of storage plus solar to improve load shifting, renewable integration and GHG reduction.





Consider how BTM Storage Can Provide Grid Services

- Consider options to enable Behind-the-Meter (BTM) storage systems to help meet grid operational needs, including voltage support, resiliency and reliability, and grid services in the Integrated Distributed Energy Resource (IDER) proceeding.
- Explore barriers to SGIP-funded storage offering grid services in IDER and Distributed Resource Planning (DRP) proceedings, including potential barriers posed by provisional incrementality rules.
- Examine how BTM storage can play a comparable role to Front-of-the-Meter (FTM) energy storage in offering grid services as part of “non-wires alternative” RFOs within IDER and DRP proceedings.

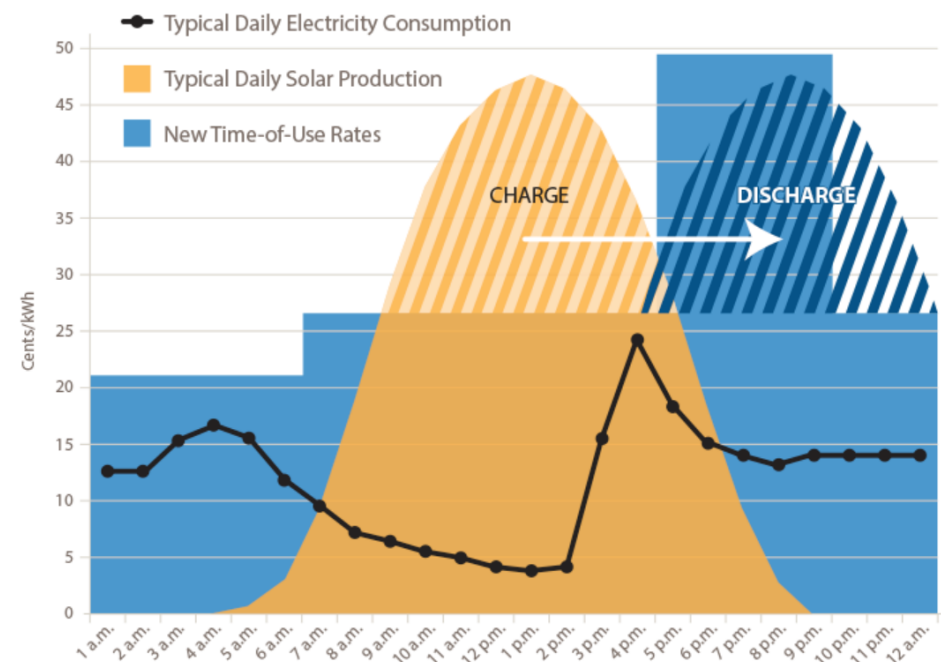




Refine Storage Interconnection & Consider New Tariff Design

- Explore opportunity for next Rule 21 OIR to streamline interconnection of solar paired with storage configurations, while current Rule 21 OIR continues to streamline storage interconnection.
- Continue to identify tariff options within GRCs that enable storage and storage paired with solar to address duck curve issues such as seasonal over-generation and need for fast evening supply ramps.
- Implement aspects of SB 1339 (Stern) which calls on CPUC to develop microgrid tariffs that include storage and solar integration measures.
- Consider the value energy storage could provide to the grid and customers as part of the NEM 3.0 revisit, informed by 2018 CPUC ZNE grid integration cost study that found BTM storage could significantly mitigate the grid integration costs of high penetration PV scenarios.

Residential Energy Use Profile





Legislative Drivers have supported Storage Programs

AB 2514 (2010, Skinner)

SB 100 (2018, DeLeon)

SB 700 (2018, Wiener)

SB 1339 (2018, Stern)

SB 801 (2016, Stern)

AB 2868 (2016, Gatto)

AB 33 (2016, Quirk)

2010: Genesis

- AB 2514 directed CPUC to establish utility storage procurement framework.
- Storage mandate set policy goals of **GHG reduction**, **renewable integration**, and **grid optimization**.
- CPUC adopted a multi year storage procurement mandate of 1,325 MW by 2020.

2016: Refinement

- SB 801 directed utilities to procure a minimum of 20 MW storage to address Aliso Canyon reliability
- AB 2868 directs utilities to procure up to 500 MW of distributed connected storage
- AB 33 requires the CPUC to consider long duration bulk storage (was done in conjunction with IRP)

2018: Stretches Goals Further

- SB 100 increases the RPS to 60% by 2030 and requires renewable and zero carbon resources to supply 100% of CA's electricity by 2045
- SB 700 extends SGIP program administration to 2026.
- ~~SB~~ 1339 directs CPUC to evaluate microgrid tariff design, including assessing role of storage.





CPUC Storage Efforts have Achieved Significant Milestones

2013

- **CPUC Set Storage Target:** 1,325 MW utility storage procurement target in D. 13-10-040.
- **CPUC Set Storage expectations in SCE & SDG&E Local Capacity Authorizations:** part of strategy to replace nuclear and gas fired electric generation with preferred resources.

2014

- **IOUs Started Storage Solicitations:** IOUs issue first biennial storage solicitation.

2015

- **CPUC Approved:** SCE Application to replace conventional resources with storage.
- **CPUC Approved:** Utility contracts from first biennial energy storage solicitation approved.

2016

- **IOU Storage Solicitations:** PG&E, SCE issue second biennial energy storage solicitation.
- **CPUC Supported CAISO Market Reforms for Storage:** CAISO Distributed Energy Resources Provider (DERP) aggregation framework facilitates storage market participation.
- **CPUC Approved:** SCE, SDG&E's storage procurement to address Aliso Canyon reliability.

2017

- **CPUC Approved:** Rules and tariffs regulating energy storage station power consumption.

2018

- **IOU Storage Solicitation:**
 - IOUs issue first solicitation for up to 500 MW distribution interconnected storage
 - PG&E 567.5 MW storage proposal, single largest utility storage procurement proposal in U.S.
- **CPUC Approved:**
 - Storage Multiple Use Application (MUA) rules
 - Distribution Resources Plan (DRP) adopts distribution deferral framework





CAISO/FERC Policy Context

- FERC Order 841 – requires ISOs/RTOs to establish wholesale market participation rules for storage
- FERC DER docket – ongoing examination of requiring market participation rules for distribution interconnected resources.
- CAISO planning, rules and participation models:
 - Proxy demand response (PDR), non generator resource (NGR) and distributed energy resource provider (DERP)
 - Storage in CAISO Transmission Planning Process (TPP)
 - Storage as Transmission Asset (SATA)
 - Energy Storage and Distributed Energy Resources (ESDER) stakeholder initiative, Phases 1, 2, and 3. Phase 4 will address MUA.





Market Conditions

- Increased penetration of variable resources
- Need for fast, flexible resources to integrate and shift increasing solar production to shoulder periods.
- Expected retirement of gas and nuclear resources
- Reduced lithium Ion battery costs in CA, which are consistent with GTM reported 50% global cost reductions between 2013 and 2018, and increased supply of lithium and cobalt;
- Transmission & distribution deferral opportunities using storage
- Regulatory framework for multiple storage value streams (aka MUA) enhanced storage cost-effectiveness

